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WOODS HOLE OCEANOGRAPHIC INSTITUTION

WOODS HOLE, MASSACHUSETTS

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THE COVER

The sight of a ship with anchor ball hoisted in the middle of the ocean may cause eyebrows to be raised on the bridge of a passing steamer. Once when the research vessel ATLANTIS was anchored in 2,000 fathoms of water, a ship stopped to inquire the reason for such quaint behavior.

To make direct observations of ocean currents, the ship anchors by bending a 250 pound Danforth anchor to 25,000 feet of 1/2 inch trawl wire.

ATLANTIS, built in 1930 at Copenhagen, Denmark, is the largest ketch-rigged vessel in the world, and is the only vessel in the United States designed and built for oceanographic research. The steel hull, 142 feet over-all, carries a crew of 17 officers and men and from five to nine members of the scientific party.

W. M. Dunkle

▶ EDITORIAL

Due to the ever increasing interest in oceanographic research it has been considered advisable to make a modest start with a publication to acquaint the many friends of the Woods Hole Oceanographic Institution with the research in progress.

By the very scope of oceanography, covering as it does many fields of science, it will be impossible to report on all phases of the study of the seas. However, it is our hope that a collection of the issues of "Oceanus" eventually may form a worthwhile reference to modern oceanographic exploration.

In this issue our lead article is a condensation of an interesting account of the future of physical oceanography, recently presented to the executive committee of our trustees. The discovery of new fishing grounds, told on pages 8 - 11, has been received with great interest by the New England fishing industry.

We shall attempt to be neither too technical nor too popular in "Oceanus". The editor expresses the hope that readers will communicate their reactions in order that future issues may contain the type of information most desired.

▶ WELCOME TO THE ASSOCIATES

It is desired to take this opportunity to extend a warm and cordial welcome to the newly formed WOODS HOLE OCEANOGRAPHIC ASSOCIATES, and to greet its first president, Mr. Gerard Swope, Jr., of New York and Woods Hole.

May outstanding success attend the activities of the ASSOCIATES to furnish increased encouragement and support to the future growth of the scientific exploration of the sea.

We are proud of the accomplishments of our Institution at Woods Hole, and anticipate with confidence and pleasure the interest and allegiance of the young WOODS HOLE OCEANOGRAPHIC ASSOCIATES.

Sincerely,

A. C. Marts, President,
Woods Hole Oceanographic Institution

▶ PHYSICAL OCEANOGRAPHY AT WOODS HOLE

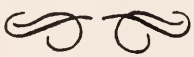
For many years the major effort of physical oceanography has been aimed at reaching an understanding of the circulation - the water movement - of the ocean. Most oceanographic problems cannot be solved without a knowledge of the behavior of the permanent current system.

The general knowledge of ocean currents has been acquired from ships' reports of drift. The averaging of these data led to the charting of broad, slow current, steady in direction, whereas recent oceanographic observations have shown narrow, swift and meandering currents.

A more accurate picture of the flow of permanent ocean currents can be deduced from the distribution of temperatures at a depth of 200 meters (about 650 feet) below the sea-surface.

During the past two years the main objective of our field work has been to fill in the weak parts of the 200 meter temperature chart of the North Atlantic. This will have been essentially completed when the ATLANTIS returns in December. Previous cruises of Institution vessels and U. S. Hydrographic Office ships, when combined with the older data, had pretty well covered the western half of the ocean and the northeastern quadrant, but temperature data from the southeastern quadrant and within the trade wind belt generally have been deficient. The work of ATLANTIS and ALBATROSS III last winter and of the ATLANTIS this summer and autumn have remedied the situation so that within six months we will be able to issue a reliable chart of temperatures at 200 meters for the whole ocean. Approximately 150,000 observations will be available. Preliminary editions of this chart indicate how basic such a chart is for the future of physical oceanography.

In the first place, the temperature distribution at 200 meters provides a reliable picture of the average, permanent surface currents, the flow being along the lines of equal temperature and in proportion to the closeness of their spacing. A far clearer picture of the pattern of the stronger currents is obtained in this way than by averaging ship reports of drift, as has been done in the past. In the second place, at 200 meters seasonal changes in temperature are at a minimum. Over most of the ocean the 200 meter level is above the permanent thermocline and below the seasonal thermocline. In other words, at 200 meters the temperature-depth curve, except near the equator, is nearly vertical, and in equatorial waters the seasonal changes are small. The result is that at 200 meters we can look at the ocean without the disturbing effect of seasonal thermal changes.



PRACTICAL APPLICATIONS

This chart has great biological significance, both as a current chart and as a chart which marks off large areas having relatively uniform ecological conditions. At least six such areas in the North Atlantic can be recognized on the basis of the preliminary 200 meter temperature chart, which will soon be greatly improved.

The degree to which the ocean responds to the seasonal changes in climate will also be obtainable from the chart with the aid of the monthly mean surface temperature Atlas. The lines of equal temperature show the direction and velocity to which these thermal changes are being transported.

CURRENT FORECASTING

The actual proof of our understanding of oceanic circulation is to be able to predict changes. We are very close to being able to do this. We have an advantage over meteorology in that the changes in the ocean are much slower, probably ten times less rapid, than in the atmosphere. Over the next five years, or more, the primary job in physical oceanography will be to understand how different the synoptic situation, as far as the currents are concerned, may be from the average situation as indicated by the 200 meter temperature chart.

It has been the fashion of recent years to argue that the currents are mainly driven by the winds. Not only is the theory much simplified through this stand, but one can also conveniently dodge the basic difficulty encountered in meteorology. Practical meteorologists do not look for the cause of the winds. They seek only to discover how long the winds will remain unchanged. Oceanographers are increasingly being forced to face this issue squarely. If there are winds there is a difference in the heating from one side of the wind

to the other because the atmospheric circulation is in fact a heat engine. If there is this difference the ocean must also respond to it. The closer coupling of meteorology and oceanography will have profound effects on both subjects, and this is already beginning to be felt as more and more research meteorologists become familiar with what is being discovered about the ocean.

NEW INSTRUMENTS

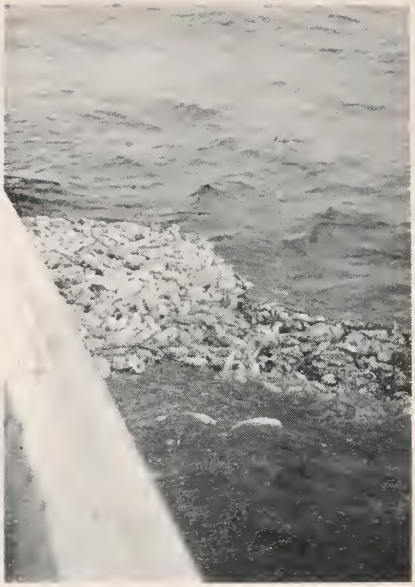
Until recently, in oceanography we have worked almost entirely with spot observations, it being considered impractical to obtain long series of continuous data from the open ocean. This is no longer the case and we are hard at work on instruments that can be set out and left unattended for a year or more. The most promising scheme that has come forward is to record the changes in electrical potential that accompany the changes in ocean currents. In its simplest form such measurements are already being made in the Florida Straits where electrodes have been set on the beaches on either side and linked together by the telephone cable from Key West to Havana. In this way a continuous record of the transport through the

Florida Straits is obtained. Our objective is to learn how to predict what effects these changes will produce as they are transmitted downstream.

Existing ocean cables, for example the one from Halifax to Bermuda can be used in the same way. It is hoped to supplement these cable measurements with instruments set out on the bottom and recording the changes that occur between much more closely spaced electrodes. In this way it is believed that a network can be set up that will keep track of what has been going on in the ocean currents continuously. Such information will in turn have a profound effect in extending the period for which useful weather forecasts can be made.

Although we have stressed the applications that advances in physical oceanography will have to its sister science meteorology, the effects may well be of similar proportions in marine biology. Assuming that reliable predictions of changes in the pattern of surface and near surface currents can be made, one important cause of biological fluctuations will no longer be unknown.

The developments which are so briefly sketched will not take place quickly. Research is slow.



FISHING GROUNDS DISCOVERED

The problem how to obtain sufficient food for an ever increasing world population has received much attention during recent years. It has been the fashion of writers on this subject to ignore the world's largest producer, the ocean, or dismiss it with a few gloomy references to the excessive hunting of whales or the decline of some fishery due to man-made causes. Many oceanographers feel that the present and potential productivity of the ocean has not been acknowledged. True, we still do not know enough about the basic productivity of the sea, but there seems to be no doubt that the present

harvest of the sea, amounting to about 1% of the world's food production, can be increased materially.

Several years ago the Woods Hole Oceanographic Institution started an exploratory fishing program to determine if commercially valuable fish could be found along the edge of the continental shelf at depths beyond the range of the New England fisheries. Two short cruises made with the research vessel CARYN were not too encouraging, partly due to the fact that the CARYN was not well fitted and underpowered for such work. Last summer the program met with considerable success. A chartered local dragger, the CAP'N BILL II, owned and skippered by Henry Klimm, Jr., investigated the bottom along the continental slope between points from offshore New York to Nova Scotia. Three potentially important resources were found.

REDFISH

Southeast of Halifax, Nova Scotia a prolific ground of redfish was located at a depth of about 300 fathoms. Redfish, sold frozen as ocean perch, is the largest catch in volume in New England and is the major source of income for the Gloucester (Mass.) fishery. The large size of the redfish caught indicated a virgin territory. Several hauls, each of one half hour duration, were made and surprisingly large catches were obtained, even in the small exploratory nets that were used.

Mr. William C. Schroeder, leader of the fishing program, was enthusiastic. "This was by far our most successful series of cruises," he said upon his return to Woods Hole. Mr. Schroeder, who has been associated with the Institution since 1932, is also Associate Curator of Fishes at the Museum of Comparative Zoology at Harvard University and, together with Dr. Henry Bigelow, has published many scientific papers and an extensive monograph on sharks.

LOBSTERS

Lobsters were found in abundance some 90 miles southeast of Martha's Vineyard at a depth of about 90 fathoms. "The lobsters were mostly of good marketable size," said Mr. Schroeder, "weighing from 1 1/2 to 6 pounds." He estimated that with a commercial trawl important catches might be made in this region. Some lobsters, including undersized ones, were found out to 235 fathoms, at greater depths than ever before reported.

CRABS

A new food product was found in the abundant presence of a large red crab (genus Geryon), unknown to the fisheries. This crab was taken along the entire range of the exploratory cruises and was found to have an excellent, sweet taste. As a canned product it should prove the equal of any crabs now marketed.

Some other food fishes, such as grey sole and Greenland halibut, although not found in abundance, were taken in sufficient quantities to indicate a valuable by-product for a deep water fishery.

The hauls brought many rare fishes to the surface including about six which were unknown to science and others never caught in the western Atlantic ocean. The most remarkable fish obtained was a deep water member of the cod family, Gadus potoussou, known from a few catches off Norway, Iceland and in Polar regions.

One new species of chimaera was found among about twenty specimens of this strange looking bottom animal, a rarely captured relative of the sharks and skates.

"What makes the fishes tick", or the study of the biological functions of deep water fishes was studied by Dr. Per Scholand and Dr. Leonard van Dam who accompanied Mr. Schroeder on one of the cruises to obtain gas and blood samples from many of the specimens.

The results of the cruises were published in the commercial fishery magazines and received widespread attention, several ships making ready to fit out for deep water fishing. It is planned to continue the work next summer, perhaps fishing in even deeper water. Financial support for such work is not readily forthcoming but the Institution believes that a new program should first show its value and that support then will follow.

The photograph on our cover is one of many excellent "shots" made by Donald H. Fay, First Mate of the ATLANTIS.

▶ WHERE ARE THE SHIPS?

The research vessel ATLANTIS (Captain John F. Pike) left Recife, Brazil on October 30 for the last leg of her cruise in Equatorial waters. The last port of call will be Trinidad, B.W.I. before her return to Woods Hole about December 15.

The ship left Woods Hole on July 19 on cruise A-181 in company with the tug KEVIN MORAN and was first engaged in geophysical exploration for Dr. W. M. Ewing. ATLANTIS refueled at Bermuda, Dakar, and Rio de Janeiro where Mr. Frederick Fuglister took over as chief scientist. Ocean currents will be studied on the return cruise.

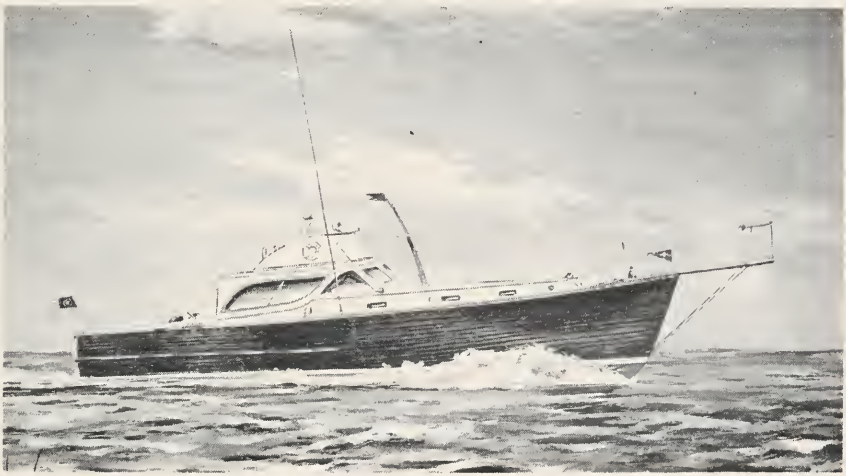
Since early summer the CARYN (Captain Arvid Karlson) and the chartered motor vessel BEAR (Captain Eugene G. Mysona) have been out on short cruises on the continental shelf studying the properties of underwater sound for Dr. J. B. Hersey's program. The ships also made a ten-day Gulf Stream survey in October.

The ASTERIAS (Captain Russell E. Bosworth) is in Maine surveying the Kennebec River outflow and has been engaged in physical and geological studies of Massachusetts Bay.

The amphibian PBY airplane (Captain Norman Gingrass), on loan from the U. S. Navy, flew to Bermuda to study the exchange of heat between the ocean and the lower atmosphere after making several aerial surveys of the Gulf Stream between Cape Hatteras and George's Bank.

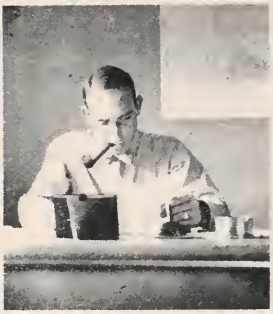
▶ GIFTS AND GRANTS

Mr. Samuel A. Peck of New York, a member of the Woods Hole Oceanographic Associates, donated his 45 foot twin-screw sportfishing boat, ALLURE, to the Institution. The ALLURE was brought to Woods Hole from Florida in late October. The much appreciated gift may be sold or used in any way that the Institution desires. It has been suggested that the ALLURE be used to study the migration and ecology of the blue fin tuna, striped bass and blue fish; to locate schools of fish by underwater sound; study sea noises of biological origin; develop air-sea rescue methods and other problems in adjacent waters.



The Rockefeller Foundation has granted $75,000.00 to support work in marine biology for three years at the Institution.

The Seaplant Chemical Corporation of New Bedford, Massachusetts is sponsoring an investigation of the possibilities of securing certain useful products from marine algae.



MASTER OF SAIL

The success of an oceanographic cruise depends to a great extent upon the master of the research vessel who is in the peculiar position of having a second captain on board in the person of the chief scientist. The chief scientist orders the ship's course and decides when and where the vessel will be stopped to make observations, but the captain has the final responsibility and decision whether the suggested program is feasible.

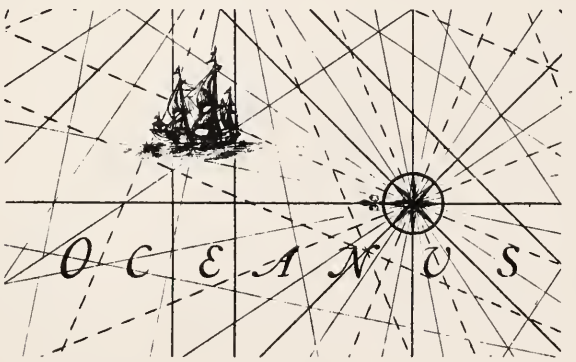
Captain Adrian K. Lane who commanded ATLANTIS from 1946 until last summer has been one of the most successful masters of our flagship. Now shorebound as our Port Captain, he stated the problem succinctly, saying: "The captain has to be a diplomat and must have a darn good reason when he says 'No', since he deals with the sort of people who can come back in five minutes with a good argument to make him say 'Yes'."

"Adrian",who has earned the respect and friendship of the dozens of scientists who have sailed under him, is a typical captain of the old school, despite his youthful years. He holds an unlimited license as "Master of Sail" and is justly proud since there are but few people who possess this certificate or can acquire it.

Perhaps it was no accident that Captain Lane was born on Skippers Lane in Mystic, Connecticut. Like many other successful sailing men, he started his nautical career as a boy, sitting on the waterfront dreaming of going to sea on the passing ships. After graduating from Trinity College, he made a few cruises on yachts, entered the U. S. Coast Guard and, during the war years, commanded a corvette. He is happiest with some sail above his head and recalls with pleasure a cruise on the training ship ATLANTIC. When on a visit to Woods Hole on a Coast Guard cutter, he noticed the masts of our ships, applied for a position and a short time later took the ATLANTIS on his first cruise.

During the average of two hundred days that Captain Lane was at sea each year, his wife Marian capably and patiently analyzed thousands of water samples brought back by the ships. Recently the Lanes became parents of a son Christopher, who got his sea-legs at the age of five weeks when he went on a small boat to Martha's Vineyard.

Although Adrian is landbound now, he will undoubtedly return to sea where once again those on board will enjoy his masterful playing of the accordion during pleasant hours on the fan-tail or, in his cabin, engage in deep discussions with their widely read Captain.



▶ CURRENTS AND TIDES

Dr. Selman A. Waksman who recently received the Nobel Prize for his work with streptomycin is a Trustee of the Institution and was a staff member from 1931 to 1946, during which time he published many papers in marine bacteriology.

Our Director, Rear Admiral Edward H. Smith, U.S.C.G. (Ret.) was elected Chairman of the Board of Governors of the Arctic Institute of North America in November.

Dr. A. C. Redfield, Senior Biologist, gave a lecture in Connecticut to the Middletown Scientific Association.

Mr. L. Valentine Worthington, a staff member, is making oceanographic observations on Ice Island T-3 near the North Pole.

By the end of this year, our war-time investigations of marine fouling and its prevention will be published in book form by the Institute of Naval Proceedings.

Ground will be broken in January to start the new building adjacent to the Institution which the Navy will erect. The building will house programs under contract with the Office of Naval Research, Bureau of Ships, Bureau of Aeronautics and other naval agencies.

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